

rounded; shell sculptured with incremental lines only, color white; all specimens covered with a chocolate brown mud very hard to remove; hinge shelf below the apex somewhat broader than in other forms of this genus; hinge with a long, narrow chondrophore like *A. nucca*; left valve edentulous, with a laminar plate extending forward from below the umbo to the dorsal margin of the shell, leaving a depressed area below the umbo, into which fits a single large tooth from the right valve; muscle scars large, pallial line weak and simple.

Dimensions: length, 2.6 mm.; of anterior portion, 1.5 mm.; height of shell, 2.4 mm.

Variation: The shape of the shell is fairly consistent, but the lamina in the left hinge ranges from being practically obsolete (fig. 7a), to being pronounced and resembling a spoon-shaped chondrophore (fig. 7b, c). In the most extreme variant there is a rounded pit above the spoon-like lamina behind which is a narrow nymph-like thickening resembling a tooth (fig. 7e).

Type locality: Burch station 3833 in 75 fathoms off Redondo Beach, California, about latitude $33^{\circ}38'50''$, longitude $118^{\circ}26'30''$.

Holotype: No. 382, Allan Hancock Foundation, The University of Southern California.

Paratypes have been distributed to: Stanford University Paleo. type collection, No. 6924; The Academy of Natural Sciences of Philadelphia; the United States National Museum; The California Academy of Sciences, The San Diego Society of Natural History, and the collections of George Willett, A. M. Strong, and S. S. Berry. The remaining paratypes are in the collection of the author.

OUTLINE OF AMERICAN OLEACININAE AND NEW SPECIES FROM MEXICO

BY H. BURRINGTON BAKER

This is part 8 of a series on Mexican mollusks collected for Dr. Bryant Walker in 1926. The first part appeared (1928) as Occasional Papers Mus. Zool. Univ. Michigan, no. 193, in which symbols for localities are explained on pp. 2-25. The types of all new species will be in the University of Michigan Museum of Zoology. In the plate, the small numbers over the scales indicate their lengths in millimeters.

Dissections of 48 species show that my former brief definition of the Oleacininae (NAUT. 54: 135) might more accurately read:

Kidney primitively triangular but becoming very oblique and much broader than long; ureter opening near apical corner of lung, which becomes strongly venate in advanced groups (exc. smallest species); genitalia without evident talon and with epiphallus primitively well developed; jaw absent; radular central usually well developed and centrifugals with dominant mesocone and mainly without ectocones (exc. *Varicella*); salivary glands forming a ring around oesophagus (not complete in *Eustreptostyla*); S-loops of hindgut large; shell elongate, imperforate (exc. *Oryzosoma*), with continuous or intermittent (varix) growth and with variously modified columella.

New subgenera are: *Singleya*, type *Euglandina singleyana* (W.G.B.); *Cosmomenus*, type *E. cumingii* (Beck) from Venezuela (Occ. Papers Mus. Zool. Univ. Mich. 156: 43, pl. 11, f. C, D); *Guillarmodia*, *Ghiesbreghtia*, *Proameria* and *Shuttleworthia*. The older group names, within the range of this paper, are listed in order of priority.

Oleacina Röding (1798),¹ *Streptostyla* Shuttleworth (1852), *Chersomitra* Martens (1860),² *Strebelia* Crosse et Fischer (1868), *Euglandina* C. & F. (1870),² *Salasiella* Strebel (1877), *Oryzosoma* Pilsbry (1891),¹ *Pittieria* Martens (1901),¹ *Laevoleacina* Pils. (Aug., 1907), *Rectoleacina*,² *Streptostylella*,¹ *Peteniella*¹ and *Varicoturris*¹ Pils. (Dec., 1907), *Laeviglandina*,² *Varicoglandina*² and *Flavoleacina* Pils. (1908), *Eustreptostyla* H.B.B. (1927), *Streptostylops* Pils. (1933),¹ *Perpusilla* H.B.B. (1941).

In the following key, which outlines the anatomically known American groups, each subgenus or section is followed by its type species.

1. TRIBUS VARICELLARUM; epiphallus (mainly with flagellum) continuous with penis; prostate as long as uterus; minor lung veins indistinct; labial palps smallish; (12) spermatheca above aorta and shell able to contain animal; (13) ureter along margin of triangular kidney, with moderately broad and oblique base; left mantle-lappets widely separated; (25) vas deferens unbranched; Antillean:
genera *VARICELLA*, *SIGMATAXIS*, *LAEVARICELLA*.³

¹ Anatomy completely unknown.

² Anatomy of type species not known.

³ Subdivisions and types outlined in NAUT. 55: 25 & 49: 21.

2. STREPTOSTYLARUM; like 1 but epiphallus a swelling of vas deferens distant from penis; prostate absent near uterine apex; minor lung veins prominent (exc. smallest species); labial palps moderate; kidney with broader, more oblique base; (7) shell columella truncate, with involute edge; Central America to Haiti:genus *OLEACINA* or *Salasiella*?
3. Like 2 (anatomy unknown) and (4) shell solid, opaque, closely and evenly striate; Haiti:
subgenus *Oleacina* (*voluta*) s.s.
4. Like 3 but shell (under 12 mm. long) thinner, very glossy and smooth or with few grooves; (5) epiphallus entering penial apex through long verge; (6) penis with solid-tipped lateral branch; Panamá to Mexico:
subgenus *Salasiella* (*O. joaquinae*).⁴
5. Like 4 but epiphallus enters, without verge, distant from penial apex; shell usually larger; Cuba (to Haiti?):
subgenus *Laevoleacina* (*O. oleacca straminea*).
6. Like 5 but epiphallus enters penial apex; (4) penial branch filiform or absent; Haiti:
subgenus *Flaevoleacina* (*O. mülleri*).
7. Like 2 but columella with thickened, reflected, twisted edge and not markedly truncate; penis without large verge; epiphallus often absent; Costa Rica to Haiti(?):
genus *STREPTOSTYLA*.
8. Like 7 and penis with (9) lateral branch (without solid tip) and (10) epiphallus like 4-5; shell usually with rather high spire and columella appearing truncate from behind; Cuba (to Mexico?):subgenus *Rectoleacina* (*S. cubensis*).
9. Like 8 but penis without branch and (10) containing a large stimulator; salivary ring open below; shell with strong growth-threads below suture; Mexico:
subgenus *Eustreptostyla* (*S. nicoleti*).
10. Like 9 but without (8) epiphallus or stimulator; salivary ring closed; shell thinner and smoother; (11) penis very long, with retractor arising and inserting above diaphragm; inner radular teeth not greatly increasing; shell appearing biconic; mainly Mexico:
subgenus and section *Streptostyla* (*streptostyla*) s.s.
11. Like 10 but penis moderate, with retractor arising from diaphragm; inner teeth doubling in length; shell more fusiform; Costa Rica to Mexico:section *Chersomitra* (*S. nigricans*).
12. Like 7 (ureter and mantle-lappets unknown) but (1) spermatheca short; reduced shell bulliform; penis apparently simple and without epiphallus; Mexico:
genus *STREBELLIA* (*berendti*).

⁴ Section *Perpusilla* defined in NAUT. 54: 82.

termed by Martens var. *subovata*, is much closer to the typical southern subspecies, received by Shuttleworth from near Córdoba, and which I collected at Sumidero, between them.

Shell like typical but with ribs more closely and regularly spaced, and with last whorl and aperture more tapering below. Form of type much like Strebel's pl. 7, f. 2b, but last whorl still more tapering; slightly immature, so columella and peristome little thickened.

| | Alt. | maj. diam. | alt. apert. | diam. apert. | whorls |
|------------------------------|------|------------|-------------|---------------|--------|
| <i>O? camerata</i> | | | | | |
| (estimated) | 8.91 | 38(3.41) | 80(7.13) | 28(1.97 mm.) | 3½ |
| (juvenile) | 4.88 | 49(2.31) | 83(3.88) | 34(1.33 mm.) | 1¾ |
| <i>S. physodes</i> | 19.6 | 43(8.4) | 54(10.5) | 47(4.9 mm.) | 7.3 |
| <i>S. n. atypica</i> | 30.6 | 49(14.9) | 68(20.7) | 46(9.5 mm.) | 6.7 |
| <i>S. i. quirozi</i> | | | | | |
| (usual) | 32.7 | 45(14.8) | 77(25.1) | 39(9.7 mm.) | 6.5 |
| (high spire)..... | 33.8 | 45(15.1) | 72(24.5) | 41(10.0 mm.) | 6.6 |
| <i>S. vexans?</i> | 13.2 | 43(5.7) | 64(8.5) | 36(3.1 mm.) | 5.7 |
| <i>E. flammulata</i> | 6.55 | 41(2.68) | 33(2.13) | 70(1.50 mm.) | 7.8 |
| <i>E. stigmatica</i> | 17.4 | 41(7.2) | 50(8.7) | 53(4.6 mm.) | 7 |
| <i>E. pupa</i> | | | | | |
| (type) | 8.25 | 42(3.48) | 44(3.67) | 54(1.98 mm.) | 6.1 |
| (sta. 3) | 7.9 | 41(3.25) | 46(3.65) | 52(1.9 mm.) | 6¼ |
| <i>E. saxatilis</i> | 19.2 | 34(6.50) | 43(8.31) | 43(3.58 mm.) | 7½ |
| <i>E. s. convallis</i> | 21.2 | 39(8.3) | 49(10.45) | 45(4.65 mm.) | 7.7 |
| <i>E. d. montivaga</i> .. | 19.1 | 41(7.8) | 50(9.6) | 43(4.15 mm.) | 7.0 |
| <i>P. arborca</i> | 20.0 | 48(9.6) | 41(8.3) | 64(5.35 mm.) | 7.6 |

EUGLANDINA (GHIESBREGHTIA) FLAMMULATA, new subgenus and species. Pl. 5, figs. 10-12.

The type locality is Las Tortolas, near Córdoba, elevation 2700 ft. (D, I, a, 4). *E. flammulata* is the type and only species of *Ghiesbreghtia*, which is defined in the key. Since it combines a spire similar to *Varicoturris* with a short twisted columella and a less marked sutural angulation approaching *Streptostylella*, these groups are probably quite closely related. In the growth-threads on its 2nd whorl and in its elongate epiphallus, it approaches the most primitive groups of *Varicella*.

Shell (f. 10) fairly solid, translucent, ovoid turrite; light buff with varices preceded by broad chestnut bands, which are broken near middle of last whorl; burnished although with low growth-threads. Apex ogival; embryonic whorls 2½, quite high and soon

(on 1st) assuming very fine contiguous arcuate growth-threadlets, which, on 3rd, gradually change into neanic sculpture (like adult but weaker). Later whorls gradually increasing, narrowly truncated at suture by an angulate cord, below which are very low but angulate, quite evenly spaced (12.5 per mm. on last) major growth-threads with microscopic minor ones between, both becoming weaker towards base of last whorl, which is flattened below greatest width. Aperture small, narrowly truncate above and broad below; outer lip thickened internally and weakly concave where, as viewed laterally (f. 12) it is almost angularly arcuate. Columella very short and concave, with lightly thickened edge and so twisted that its abrupt truncation is only apparent when viewed from left side (f. 11); twist still broader in penult whorl.

EUGLANDINA (GUILLARMODIA) PUPA, new subgenus and species.

Pl. 5, figs. 8-9.

The type lot came from below Atoyac, 1300-1415 ft. (D, I, a, 1). *E. pupa* is the type of *Guillarmodia*, which has a shell similar to *Salasiella*, but with more, less rapidly increasing whorls, with lip arcuate farther from suture, and with more thickened peristome and columella. "*Salasiella*" *elegans* Martens (1895) seems closely related, but larger, more corneous, with regular and more whorls and with columella more concave and heavily thickened.

Shell (f. 8) rather solid, translucent, elongate ovoid; uniform porcelain-white or very pale buff; almost polished although with obsolescent growth-wrinkles. Apex parabolic; embryonic whorls 2.6, quite high, almost smooth until 3rd, which assumes neanic sculpture; suture with fairly wide bevel. Later whorls irregularly increasing (variable), with occasional varices, but with close microscopic growth-wrinkles (or striae) extremely weak; suture widely beveled, weakly impressed. Aperture smallish, broadest near base; outer lip well thickened internally, almost vertical below suture but strongly arcuate near middle (f. 9). Columella moderately long, concave and obliquely truncate, with thickened edge.

EUGLANDINA (PROAMERIA) SAXATILIS, new subgenus and species.

Pl. 5, figs. 2-3.

The type came from below Necaxa, elevation 3000 ft. (D, II, a, 53). *E. saxatilis* is the type of *Proameria*, which is used to include *E. conferta*, *E. polita*, probably *E. cordovana* and perhaps all the species of the original *Varicoglandina*, except the brightly

banded typical group. *E. saxatilis* is rather similar to *E. dalli* in shape, but has higher 2nd and 3rd whorls, much shorter later ones, longer and straighter columella and much more marked growth-sulci. The figures of *E. delicatula* show a much less attenuate base and stouter whorls.

Shell (f. 2) moderately thin, translucent, slender, turrite, gradually tapering above and more abruptly below; very pale olive brown with very slightly darker color bands preceding varices; highly glossy although with regular sulci. Apex domed; embryonic whorls 2.7, moderately high, with first 2 almost smooth and then assuming growth-sulci; suture very widely beveled. Later whorls gradually increasing, flattened, with regularly spaced growth-sulci (66 + 4 varices on last), which are quite deep at suture, where they separate low rounded growth-threads, have more flattened interspaces on sides of whorl, and become shallow towards base of last; spiral striae microscopic and practically obsolete; suture quite widely beveled. Aperture small, attenuate above and narrowing below; peristome weakly thickened internally, almost vertical (lateral profile in f. 3) below suture and but weakly arcuate near middle; columella fairly long and weakly concave.

E. (P.) SAXATILIS CONVALLIS, new subspecies. Pl. 5, fig. 1.

The type locality is Tepexic, below Necaxa, elevation 2215 ft. (D, I, 55).

Shell like typical but much stouter. Later whorls more convex, with considerably stronger growth-threads (90 sulci and 4 varices on last) which are subangulate below suture. Columella more concave.

E. (P.) DELICATULA (?) MONTIVAGA, new subspecies. Pl. 5, figs. 6-7.

The type locality is above Necaxa, elevation 4925 ft. (C, II, 35).

Apparently like *E. delicatula major* (Martens) in form (f. 6) but with much weaker growth-sculpture. Like *E. saxatilis* in sculpture, but with broader and more obtuse apex, larger whorls, less attenuate base and with color bands slightly more evident; embryonic whorls much lower; last whorl with 79 sulci + 3 varices and with slightly less obsolete spiral striae; suture less widely beveled throughout; aperture broader below; peristome (profile in f. 7) more arcuate near middle; columella shorter and more concave (even than in *E. s. convallis*).

PITTIERIA (SHUTTLEWORTHIA) ARBOREA, new subgenus and species. Pl. 5. figs. 13-15.

The type locality of this arboreal species is below Necaxa, elevation 3120 ft. (D, I, e, 52), where it was fairly frequent. *P. arborca* is the type of *Shuttleworthia*. It is apparently quite closely related to *P. ambigua* (Pfr.), but has a shorter last whorl and aperture; its columella is usually shorter and more concave although quite variable; and it differs in color, as also from *P. difficilis* (C. & F.), which has more convex outlines. *Streptostyla chiriquiensis* Mts. and *S. viridula* Angas more remotely resemble this group.

Shell (f. 13) thinnish, turrite, with conic spire and broadest near base; opaque whitish, tinted with brownish or lavender, especially on spire and rarely in axial streaks, with bright chestnut, forming a band below white subsutural line, and on columella; quite polished, although with weak growth-sulci. Apex parabolic; embryonic whorls almost 3; last 2 fairly high; last assuming weak growth-sulci; suture widely beveled and not colored. Later whorls gradually increasing, somewhat convex, with very irregular, weak and often intermittent growth-sulci and striae, which are often broken or strengthened by injuries; suture quite widely beveled, weakly impressed. Aperture short and broad; outer lip thin, almost vertical (f. 14) and scarcely arcuate. Columella typically short, concave, sigmoidly twisted and with white weakly thickened edge, but abruptly truncate as viewed from left (f. 15); may be moderately long, or much straighter, or less truncate (high climbs bring long falls).

The following notes complete the list of Oleacinidae collected in 1926.

Oleacina (Salasiella) camerata H.B.B., Necaxa, 2215-4925 ft., CD, III, dead, 35, 55.

Streptostyla (Rectoleacina) physodes (Sh.) good climber, Peñuela to Sumidero, 2625-3400 ft., AD, III, de, 3-6, typical form paedogenetoid; attains a size (see dimensions) even larger than *f. auriculacca* (Pfr.). *S. lymneiformis* (Sh.), rapid climber during rain, Sumidero, D, I, ede, 6. *S. meridana* (Mo.), Progreso, E, I, dead, 61; long and short spired forms.

S. (Eustreptostyla) nicoleti (Sh.), Sumidero, 3400 ft., D, I, a, 6. *S. n. atypica* H.B.B., Necaxa, D, I, a, 54.

S. (s.s.) streptostyla (Pfr.), Córdoba to Sumidero, 2625–3400 ft., AD, I, ab, 4, 6; f. *coniformis* (Sh.) which is larger (more whorls), lighter colored, less prominently streaked and has a higher spire, at Córdoba. *S. turgidula* (Pfr.), Córdoba, 2625–3000 ft., A, I, dead, 4. *S. plicatula* Strebel, Atoyac, 1300–1415 ft., AD, I, dead, 1; probably var. of preceding. *S. glandiformis* C. & F., Córdoba, 2625–3125 ft., AD, III, dead, 3, 5. *S. yucatanensis* Pils., Progreso, E, I, dead, 61.

S. (Chersomitra) irrigua (Sh.) Córdoba, 2625–3125 ft., AD, III, de, 4; dead, 3, 5. *S. i. quirozi* Strebel, Necaxa, 3120–5500 ft., BCD, III, a, e, juvenile, 35, 52; dead, 32, 33, 36, 41; growing larger (dimensions given); usually low spired but rarely approaching Strebel's "*S. shuttleworthi*." *S. vexans* Strebel (?), Córdoba, 2625–3000 ft., D, III, dead, 4; one shell like *S. irrigua* but thinner, slenderer and with longer spire (see dimensions). *S. ventricosula* (Mo.), Progreso, E, I, dead, 61.

Euglandina (Ghiesbreghtia) flammulata H.B.B., Córdoba to Sumidero, 2700–3400 ft., D, I, a, 4, 6.

E. (Varicoglandina) stigmatica (Pfr.), Peñuela to Sumidero, 2625–3400 ft., AD, III, abed, 3, 4, 6.

E. (Guillarmodia) pupa H.B.B., Atoyac to Peñuela, 1300–2950 ft., D, III, a, 1; dead smaller form, 3.

E. (Proameria) saxatilis H.B.B., Necaxa, 2625–4925 ft., CD, III, a, 53; dead young, approaching next, 35, 54. *E. s. convallis* H.B.B., Tepexic, 2215 ft., D, I, fresh, 55. *E. delicatula montivaga* H.B.B., Necaxa, 4500–4925 ft., BC, III, dead, 35, 37, 41. *E. cordovana* (Pfr.), Sumidero, 3400 ft., D, I, a, 6.

E. (Cosmomenus) cylindracea (Phillips), under rocks, Progreso, E, I, a, 6.

E. (Singleya) candida (Sh.), Atoyac, 1300–1415 ft., D, I, dead, 1; var. *conularis* (Pfr.), smoother with straighter columella, Potrero to Córdoba, 2150–3000 ft., AD, III, dead, 2, 4. *E. sp?*, Atoyac; more obtuse apex than *E. candida*; young.

E. (s.s.) vanuxemensis (Lea), Pirámides, under cacti, 7510 ft., E, II, a, 13; var. with typical columella and long aperture, but with closer whorls, and sharper sculpture approaching *E. michoacanensis* Pils., under magücy, Guajimalpa, 9200 ft., C, II, a, 12. *E. sowerbyana estefaniae* (Strebel), Córdoba to Sumidero, 2625–

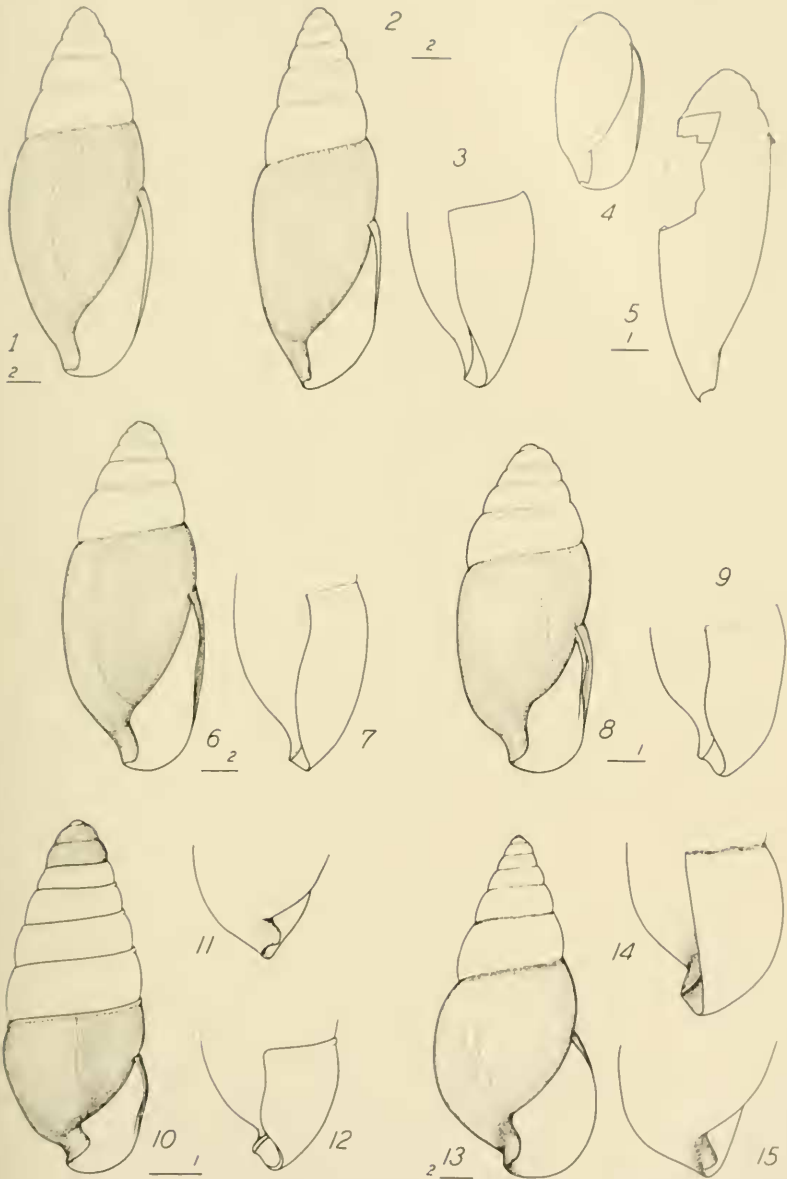


Fig. 1, *Englandina saratilis convallis*. Figs. 2-3, *E. saratilis*. Figs. 4-5, *Olacina camerata*. Figs. 6-7, *Englandina delicatula montivaga*. Figs. 8-9, *E. pupa*. Figs. 10-12, *E. flammulata*. Figs. 13-15, *Pittieria arborca*.

Scale lines = 1 & 2 mm, as marked.